**Instruction for Use**

021498/06/11

Clima Sensor D

4.9100.00.061 / 4.9110.00.061
4.9101.00.061 / 4.9111.00.061
from software version: V2.4

Clima Sensor D
4.9110.00.061

Clima Sensor D
4.9100.00.061

Clima Sensor D
4.9101.00.061

Clima Sensor D
4.9111.00.061

Contents

Table

1   Models available

Order-No.	Wind	Precipitation Brightness Twilight	Temperature	Air humidity	DCF77	RS 485	Analogue output
4.9110.00.061	X	X	X	X	X	X	X
4.9100.00.061	X	X			X	X	X
4.9111.00.061		X	X	X	X	X	X
4.9101.00.061		X			X	X	X

2   Application

The **Clima Sensor D** serves for the measurement of environmental parameters. For further processing they are available as

- serial RS485/422 telegram and as
- Analogue output

The CLIMA – Sensor D has an internal DCF77 receiver, that accepts the time signal of an atomic clock, and integrates it into the data telegram. The DCF77- transmitter is situated at Frankfurt/M.

Fields of application are building control systems, control technology, greenhouse technology or for further processing of the acquired data to recording – and indicating instruments.

Depending on the respective model, the following parameters can be measured by the Clima Sensor D :

- **Wind speed**
- **Precipitation (yes / no)**
- **Brightness in Eastern, Southern and Western direction**
- **Twilight**
- **Temperature**
- **relative Air humidity**

A fixing clip serves for the mounting on masts or plane surfaces – depending on the range of application.

Included in delivery: 1x Clima Sensor D with fixing clip

1 x Magnet

1 x Instruction for Use

3   Function

Wind speed

A cup star is set into rotation by the wind. A shaft, running in friction bearings, is fixed at the cup star, and leads two magnets past a reed contact. The pulses, thus arising, are edited and are available as defined measuring values.

Precipitation - Detection

The detection is carried out optically acc. to the reflection-method with modulated infrared-light. The analysis is done after a phase-sensitive filtering so that disturbances, caused by static or dynamic outside light-sources, such as sunlight or electric illumination, can definitely be avoided.

Brightness Detection

The brightness is detected by means of three independent photo-diodes, which are arranged in 90°-segments. Converter transform the signals, which are then available as serial, and three independent output voltages.

Twilight

The twilight is detected by a photodiode. A converter transforms the signal which is available in serial and analogue form.

Temperature measurement

A long-term-stable resistance thermometer Pt-100 is used as temperature sensor. A current source with negative internal resistance eliminates the quadratic ratio in the Pt-100 characteristic curve, so that an excellent linearity and measurement accuracy is achieved.

Humidity measurement

The measurement is carried out through a capacitive humidity sensor, which changes its capacity in accordance with the relative air humidity. An analyzing circuit converts the capacity changes of the sensor, and compensates the non-linearity and temperature-dependency of the sensor.

DCF77 Receiver

The receiver is able to receive the DCF77 signal, and to synchronize the internal clock. The cyclic time synchronization is deactivated in the status of delivery. It can be activated by means of the parameter ST. If the time shall be synchronized cyclically, it is recommended to set the parameter ST to 3. Thus, the time synchronization is carried out at night at 03:00.

Attention:

During the time synchronization by the DCF 77- receiver the measuring value acquisition is switched off. Within this period the analogue outputs are set to „0V". The data in the serial telegram are invalid; this is indicated by the "sensor status" (bit value 2^3). .

Time synchronization is deactivated (see command „ST") in state of delivery.

Condensation Protection   The instrument has an internal condensation protection. It protects the inside of the housing against condensation. It is not able to protect the housing against icing.
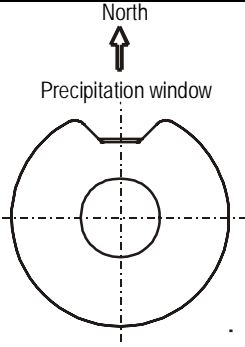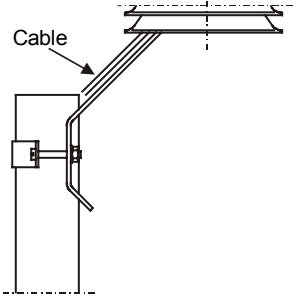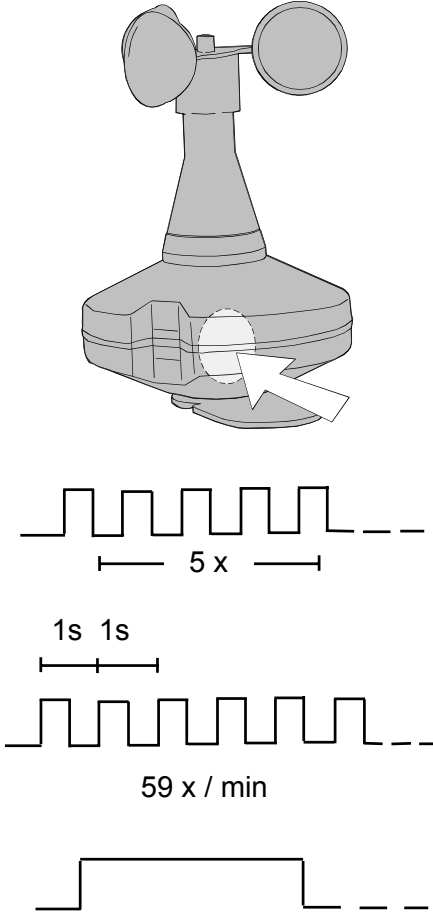
Horizontal direction depending of the brightness

North

West   **East**

South
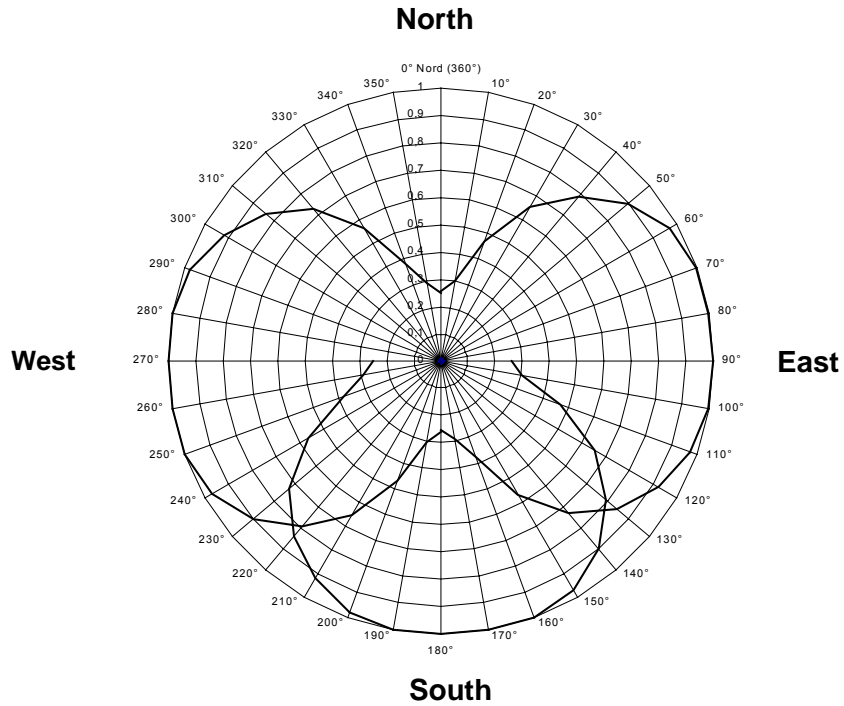
4   Installation

> **Attention:**
> *Storing, mounting and operation under weather conditions is permissible only in vertical position, as otherwise water can get into the instrument.*

North Precipitation window 	**Alignment of Sensor** The sensor is to be aligned by means of a compass so that the precipitation window points north. Thus the brightness sensors detect clearly the irritation range of the sun course, and their assignment according to direction is guaranteed.
Cable 	**Mounting** The sensor is designed for mounting on a mast tube ($\varnothing$ 35 ... 50 mm). This way of mounting facilitate the above-mentioned alignment of the sensor without problems. Please take care that the sunshine reaches the sensor all-day without shadow. The mounting near buildings or trees can affect the measuring value in a negative manner In case of wall mounting please care for a distance to the wall of at least 0,5 m, so that the function of the precipitation-/brightness sensors is not interfered.
  ⊢— 5 x —⊣ 1s 1s 59 x / min ⊢— 5 s —⊣	**...with electrical connection** • Hold the magnet included at the integrated Reed-contact, so that you hear 5 short tones. Hold the magnet in position. • The CLIMA Sensor D indicates the reception of the time signal by short tones (second cycle; pause at every clock minute). **Remark:** The quality of the time signal is not depending on the length of the tones. • When the time signal is received completely, an appropriate mounting site is found. • When the time signal is not or only partly received, choose a new mounting site. • Remove the magnet. The CLIMA - Sensor D acknowledges this finally by a tone of 5-second-length.

5   Pin Connection

Remark:

The indication of cores is always the same with all models of the Clima Sensor-D, however, the connection depends on the instrument model.

5.1   Abbreviations and Assignment

P	=	**P**recipitation	0 V	=	Precipitation "yes" (active)
			10 V	=	Precipitation "no" (passive)
B	=	**B**rightness	0 - 10 V	=	0 - 150 kLux
Tw	=	**Tw**ilight	0 – 10 V	=	0 – 250 Lux
W	=	**W**ind speed	0 - 10 V	=	0 - 40 m/s
H	=	**H**umidity	0 - 10 V	=	0 - 100 % rel. H.
T	=	**T**emperature	0 - 10 V	=	-20 - +60 °C
AGND	=	**A**nalogue **G**rou**ND**			
NC	=	**N**ot **c**onnected			
TXD-	=	RS485 Transmission path (inverted)			
TXD+	=	RS485 Transmission path (not inverted)			
RXD-	=	RS485 Receive path (inverted)			
RXD+	=	RS485 Receive path (not inverted)			
DATA-	=	RS485 data line (inverted)			
DATA+	=	RS485 data line (not inverted)			

5.2   Analogue Outputs

Order-No.	Core-No. (Color)											
	1	2	3	4	5	6	7	8	9	10	11	12
	White	Brown	Green	Yellow	Gray	Orange	Blue	Red	Black	Violet	White/Brown	White/Green
	~ / +	~ / -	+	AGND	+	+	+	+	+	+	+	AGND
4.9110.00.061	Supply 16 – 24 V AC or 16 – 28 V DC Reserve Protection		P	AGND	**B**(West)	**B**(Sou)	**B**(Eas)	**W**	**T**	**H**	**Tw**	AGND
4.9100.00.061			P	AGND	**B**(West)	**B**(Sou)	**B**(Eas)	**W**	NC	NC	**Tw**	AGND
4.9111.00.061			P	AGND	**B**(West)	**B**(Sou)	**B**(Eas)	NC	**T**	**H**	**Tw**	AGND
4.9101.00.061			p	AGND	**B**(West)	**B**(Sou)	**B**(Eas)	NC	NC	NC	**Tw**	AGND

5.3 Digital Data Interface in Full-duplex- Mode

Bestell-Nr. alle	Ader - Nr. (Color)				
	13	14	15	16	⏚
	White/Yellow	White/Orange	White/Red	White/Black	Green/Yellow
	TXD-	TXD+	RXD-	RXD+	Shielding

Remark:

*For selection of the duplex mode refer to **Command DM***

5.4 Digital Data Interface in Half-duplex- Mode

Bestell-Nr. alle	Ader - Nr. (Color)				
	13	14	15	16	⏚
	White/Yellow	White/Orange	White/Red	White/Black	Green/Yellow
	DATA-	DATA+	Reserved	Reserved	Shielding

Remark:

*For selection of the duplex mode refer to **Command DM***

5.5 Connection diagram

N = Niederschlag
P = Precipitation
H = Helligkeit
B = Brightness
W = Windgeschwindigkeit
W = Wind Speed
T = Temperatur
T = Temperature
F = Feuchte
H = Humidity
D = Dämmerung
TW = Twliight

Clima Sensor D Anschlussbelegung / Pin connection
DCF 77 + 0 - 10 V + RS 485 + Heizung / Heating

☐ 4. 9100. 00. 061 = 0...10V N H W D   / P B W Tw
☐ 4. 9101. 00. 061 = 0...10V N H D   / P B Tw
☐ 4. 9110. 00. 061 = 0...10V N H W T F D / P B W T H Tw
☐ 4. 9111. 00. 061 = 0...10V N H T F D   / P B T H Tw

+ −

West
Süd
Ost

Kabel
cable

15 - 24 V
AC / DC

N AGND H H H W T F D AGND   TXD - TXD + RXD - RXD +
P   B B B W T H TW

1 2   3 4 5 6 7 8 9 10 11 12   13 14 15 16

Versorgung
Power Supply
15 - 24 V AC
15 - 24 V DC + 10 %
Stromaufnahme < 150 mA
+ Heizung 350 mA
Current load < 150 mA
+ Heating 350 mA

Netz
Mains Power

+   ~
GND   ~

Erde / Earth

Versorgung GND / Analog AGND
Galvanische Trennung der Massen für nachfolgende Elektronik erforderlich

Operating Voltage GND / Analog AGND
Galvanic isolation of the grounds necessary with further processing electronics.

Ausgang / Output
Analog ≙

Niederschlag ja / nein
Precipitation yes / no

AGND

Helligkeit West 0..150 kLux
Brightness West 0..150 kLux

Helligkeit Süd 0..150 kLux
Brightness South 0..150 kLux

Helligkeit Ost 0 ..150 kLux
Brightness East 0 ..150 kLux

Windgeschw. 0..40 m/s
Wind Speed 0..40 m/s

Temperatur -20 ..+60 °C
Temperature -20 ..+60 °C

rel. Feuchte 0 .. 100 %
rel. Humidity 0 ... 100 %

Dämmerung 0 ... 250 Lux
Twilight 0 ... 250 Lux

AGND

Datenverarbeitung / data processing

Versorgung
Power Supply

Netz
Mains Power

Datenschnittstelle
Data - Interface

TXD - TXD + RXD - RXD +

Vollduplex - Modus
Full - duplex Mode

DATA - DATA + N C

Halbduplex - Modus
Half - duplex - Mode

6   Placing into Operation

For connection of the CLIMA-Sensor-D, first, the data lines have to be connected, and afterwards the supply voltage. Please connect the data lines of the CLIMA-Sensor-D as follows:

Connection in Full-duplex Mode

Connection CLIMA- Sensor	Connection RS485 Converter
TXD-	RXD-
TXD+	RXD+
RXD-	TXD-
RXD+	TXD+

Connection in Half-duplex Mode

Connection CLIMA- Sensor	Connection RS485 Converter
DATA-	DATA-
DATA+	DATA+

Start in the Basic Setting

Connect the CLIMA-Sensor-D to your PC via an RS485 interface converter, and start a terminal program (for ex. Hyper Terminal). Set the interface parameter to 9600baud, 8 data bits, 1 stop bit and no parity.

After the start the CLIMA - Sensor emits a tone of 1-second-length. At the same time the following message is transmitted via the serial interface:

THIES Clima Sensor D

Version X.X

ID00

Afterwards, a data telegram is output every second.

---

7   Command Interpreter

For communication the CLIMA-Sensor-D has a command interpreter that might change the behavior of the instrument. Thusly, for ex. the baud rate, the instrument ID and the starting behavior can be adapted to the internal requirements. On principle, a command is constructed as follows:

AABB<cr>

or.

AABBCCC<cr>

With:

AA: Instruments– ID. It is always two-digit, and in the range 00. 99

BB: The command, refer to **List of Commands**

CCC: A three-digit-value for setting of a new parameter value.

<cr>:   Means Carriage-return (enter-taste). This character finalizes the entry of commands.

If a command is transmitted to the instrument without parameter value, it serves for the request of the value currently set. Thusly, for ex. through the command

00BU<cr>

the starting behavior is requested.

The command TR is an exception, here. The instrument answer to command 00TR<cr> is transmitting the current data record.

By stating the parameter value 'CCC' the current parameter is changed. Thusly, for ex. through the command

00TT000<cr>

the autonomous output of the data telegram is deactivated.

All commands available for the communication are included in chapter **12**.

8   Precipitation Recognition

The CLIMA-sensor has an optic precipitation recognition. The threshold, when the precipitation output is set, is selectable via the software. The sensitivity can be set between 1 and 30 by the parameter PE. One means that already with the first identified precipitation particle the precipitation output is set. Thirty means, that within one minute approx. 30 precipitation events must be identified before precipitation is signalled. The internal scanning of the precipitation event is every second, whereat the precipitation particle generates an internal pulse of up to 3sec. length, depending on the size.

On delivery the parameter PE is set to 15..

In case no further precipitation event has been identified within a time period of one minute, the precipitation output is switched off.

Definition of the analogue precipitation output:

  0 V output = the precipitation output is „active"
  10 V output = the precipitation output is „passive"

9   Telegram Output

The CLIMA-Sensor-D outputs the data autonomously or on request. In all cases the telegram has the following format:

The CLIMA-Sensor-D outputs the data as follows:

(STX) date / time; brightness, East; South; West; twilight; humidity; temperature; precipitation; WS; status of sensor; check sum; (ETX CR LF)

Example for the telegram output:

(STX)30.05.06 16:13:50;007.8;011.6;003.8;!!!;054;+20.1;0;00.0;00;0E(ETX CR LF)

Data value	Beginning in the telegram	Length
STX	0	1
Date/Time	1	17
Brightness East	19	5
Brightness South	25	5
Brightness West	31	5
Twilight	37	3
Humidity	41	3
Temperature	45	5
Precipitation	51	1
Wind speed	53	4
Status of sensor	58	2
Check sum	61	2
ETX; Carriage return linefeed	63	3
	66Characters	

Format Date:

dd.MM.yy

dd: Day of month with leading zero

MM: Month of the year with leading zero

yy: Year with leading zero

Format Time:

hh.mm.ss

hh: hour in 24-hour-format with leading zero

mm: Minute with leading zero

ss: Second with leading zero

Format Brightness:

nnn.n : 5 digits, indicates the brightness 0…150kLux

Format Twilight:

nnn : 3 digits, indicates the twilight 0...250Lux. If the measuring value exceeds 250Lux the output
shows "!!!".

Format Temperature:

+nn.n : 5 digits, with leading sign (+ or -) and one decimal place in °C

Format Humidity:

nnn : 3 digits from zero to 100%

Format Precipitation:

n :   1 digit, Precipitation yes/no. When the supply voltage falls below a certain value, „!" is output
for the status of precipitation.

Format Wind Speed:

nn.n : 4 digits, 0…40 m/s (two positions before decimal point, one decimal place)

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Status Sensor:

nn : indicates the status of sensor. The status value is a combination of several single states, which are linked together in binary state. The status is output as hexadecimal value. The individual bits have the following signification:

Bit value	Signification
2^0	Is set if the necessary internal instrument voltage falls below. In this case the precipitation detection does not work faultless any more.
2^1	Is set in case the last synchronization of the time fails. Is reset in case of correctly received time.
2^2	Is set when the heating is activated. (temperature under-shooting or set manually by command)
2^3	Is set during time synchronization.
$2^4 .. 2^7$	Reserved.

Format Checksum:

nn : Hexadecimal presentation of EXOR-link from character after STX (w/o STX) to semicolon before checksum (inclusive).

If a data value is not within the required measurement interval, instead of the value !!! is output, for ex. with twilight. If the analogue output delivers no valid value, ??? is output, for ex. with temperature and humidity.

10 DCF77 Receiver

For time-synchronous processing the CLIMA-Sensor-D has an internal DCF77-receiver, that is able to receive the atomic-accurate time signal. This signal is transmitted from Frankfurt Mainflingen. The transmission of a complete date-/time information takes 1 minute.

The DCF77-receiver of the CLIMA-Sensor-D is designed in such a way that it has to receive two successively transmitted time-signals. The received information have to show a difference of one minute. I.e. the synchronization with faultless reception may take a time of up to three minutes.

The time-synchronization can be started by the following action:

- Automatic synchronization after connection of the voltage supply, ref. to command *command BU*

- Manual starting of synchronization by command *command GT*

- Manual starting of synchronization by means of a magnet

- Automatic synchronization of the time by parameter ST.
  If the parameter ST is set to a value >, no time synchronization is carried out.

> ### Attention:
>
> ***During the time synchronization by the DCF 77- receiver the measuring value acquisition is switched off. Within this period the analogue outputs are set to „0V". The data in the serial telegram are invalid; this is indicated by the "sensor status" (bit value 2^3).***
>
> ***Time synchronization is deactivated (see command „ST") in state of delivery.***

The instrument outputs a brief data telegram with the time synchronization, where the quality of the DCF77-reception can be derived from. The telegram has the following format:

(STX)DCF ‚A' ‚nn'(ETX CR LF)

DCF means DCF77 and is a constant text.

‚A' can accept the values 0,1,X and Y

Value for ‚A'	Signification
0	A bit with the information ‚0' has been received
1	A bit with the information ‚1' has been received
X	The received signal could not be related
Y	No signal has been received for at least 2 seconds. Is also signal with minute changing

Table: Value for ‚A' in the DCF77 reception telegram

‚nn' means the internal reception quality and has the following signification:

Value for ‚nn'	Signification
8..17	Signal is interpreted as bit with the information '0'. With optimal reception the value is 12
21..30	Signal is interpreted as bit with the information '1'. With optimal reception the value is 12

Table: Value ‚nn' in the DCF77 reception telegram

The reception can be interpreted on the basis of the values for ‚nn' as follows:

Value for ‚nn'	Signification
12 resp. 24	Optimal reception
Values range between 8 and 17 resp. 21 and 30	Bad reception. It might occur that the DCF77 cannot synchronize itself.
Intermittent telegram DCF X 00	Received signal is beyond the tolerance and cannot be interpreted. Time synchronization is not possible. Possibly temporary disturbances or generally bad reception.
Intermittent telegram DCF Y 00	No DCF77 reception. Possibly, there is a source of interference in the proximate ambience, or the DCF77 signal is completely shadowed.

Table: Appraising the DCF77 reception quality

> ### Attention!!
>
> *In industrial ambience or close to electro-magnetic sources of interference, such as PC-monitors, electric motors, contactors the DCF 77 signal can be disturbed, and no reception is possible.*
>
> *A DCF77 reception cannot be guaranteed. It depends on the local conditions.*

.

In parallel to the output of the DCF reception status in the telegram, there is also the possibility of indicating the status acoustically. Here are two options:

- Starting of the synchronization through the command 00GT002

- Starting of the synchronization through an external magnet.

In all cases a pulse is output on reception of a signal. Depending on the received signal the tone length is 0.1, and 0.2 seconds, respectively.

The termination of the time-synchronization is carried out autonomously by the CLIMA-Sensor. The following abort-conditions may lead to the termination of the time-synchronization:

- The CLIMA-Sensor-D has received valid signals within two successive minutes. The time is set, the status with the valencies 2^1 is reset.

- The CLIMA-Sensor-D receives no signal for a period of 5 seconds. The status with the valency 2^1 is set.

- For 5 minutes the CLIMA-Sensor-D receives signals, however cannot derive a valid date/time information. The status with the valency 2^1 is set,

- Synchronization after Start of System

In the pre-setting the CLIMA-Sensor-D does not begin with the synchronization of time immediately after the switching-on. The instrument acquires the measuring values, and outputs them. In order to synchronize the time directly after the start of system the command BU must set to 1:

00BU0<cr>	:	no synchronization after program start
00BU1<cr>	:	synchronization of time after program start without buzzer
00BU2<cr>	:	synchronization of time after program start with buzzer

10.1 Synchronization by serial Command

Through the command GT the synchronization of time can be started via the serial interface. The command GT has the following functions:

00GT0<cr>	:	Terminates the time synchronization
00GT1<cr>	:	Starts the time synchronization without buzzer
00GT2<cr>	:	Starts the time synchronization with buzzer

10.2 Synchronization by external Magnet

Another synchronization of time is possible by means of a magnet. For this, a Reed-contact has to be closed by means of a magnet on the left side of the CLIMA-Sensor-D.

Please proceed as follows:

1. Lead the magnet to the housing. The buzzer outputs 5 short tones.

2. Afterwards, another tone is output with each received second-signal. Depending on the received signal, '0' or '1' is a short or long tone.

3. When the magnet is removed from the instrument, the reception mode is ended automatically.

10.3 Cyclical Synchronization

The cyclical time synchronization is deactivated in the status of delivery. If the time shall be synchronized cyclically, it is recommended to set the parameter ST to 3. Thus, the time synchronization is carried out at night at 03:00. The time of synchronization is adjustable by parameter ST (synchronization time). If a value > 24 is assigned to ST, the time synchronization is deactivated. During the cyclic synchronization the short DCF77 receive protocol is output, if the independent telegram output (TT001) was selected.

> **Attention:**
>
> *During the time synchronization by the DCF 77- receiver the measuring value acquisition is switched off. Within this period the analogue outputs are set to „0V". The data in the serial telegram are invalid; this is indicated by the "sensor status" (bit value 2^3).*

11 Factory Settings

Command	Value	Description
BR	5	Baud rate 9600 8,N,1
BU	0	No time synchronization after start
DM	1	Full-duplex mode
ID	0	Internal ID is 0
PE	15	Precipitation events within one minute for setting the precipitation output
ST	24	Automatic time synchronization is deactivated
TT	1	Autonomous telegram output

12 List of Commands

The following commands are available for the CLIMA-Sensor-D:

	Command	Description
Command BR	<id>BR<para>	Selection of Baud Rate
Command BU	<id>BU<para>	Clock synchronization on system start
Command DM	<id>DM<para>	Duplex mode
Command GT	<id>GT<para>	Start of clock synchronization by serial command
Command HC	<id>HC<para>	Humidity correction (internal calibration value)
Command ID	<id>ID<para>	Instrument-ID
Command PE	<id>PE<para>	Precipitation events for setting the precipitation output
Command RC	<id>RC<para>	Reference correction (internal calibration value)
Command SA	<id>SA<para>	Serial number BYTE A
Command SB	<id>SB<para>	Serial number BYTE B
Command SC	<id>SC<para>	Serial number BYTE C
Command ST	<id>ST<para>	Moment of time synchronization
Command TC	<id>TC<para>	Temperature correction (internal calibration value)
Command TR	<id>TR<para>	Telegram request
Command TT	<id>TT<para>	Autonomous telegram output
Command VC	<id>VC<para>	Voltage correction

Command BR

<id>BR<para3>   Select the baud rate

Description: The communication can be carried out at different baud rates. The setting range varies from 1200Baud to 19200 baud. For BR the following baud rates are defined:

Parameter description:

2:	1200 Baud	8,N,1
3:	2400 Baud	8,N,1
4:	4800 Baud	8,N,1
5:	9600 Baud	8,N,1
6:	19200 Baud	8,N,1

Table 1: List of baud rate with telegram BR

On request of baud rate through command BR the CLIMA - Sensor transmits the current baud rate.

Value range: 2..6
Initial value: 5

Command BU

<id>BU<para3>   Time synchronization on the boot up

Description: The command determines the behavior of the time synchronization after the boot up.
                      The following parameters are available:

Parameter description:

0:	No time synchronization
1:	DCF77 synchronization is started. The buzzer is deactivated.
2:	DCF77 synchronization is started. The buzzer is activated.

Table 2: Instrument start and automatic time synchronization through command BU

Value range: 0..2
Initial value: 0

Command DM

<id>DM<para3>   Duplex Mode
Description: The duplex mode decides on the character of the physical compound. In the full-duplex
                      mode the transmission- and reception-signals are transmitted each via separate Twin-
                      wire-cable. Consequently, an optional transmission and reception is possible.
                      In half-duplex operation the transmission- and reception signals are transmitted via the
                      same twin-wire-cable.
                      The change-over from full-duplex to the half-duplex mode can be carried out only
                      under the following conditions:
                      - No autonomous telegram output (TT000)

Parameter description:

                      0:          Half duplex operation
                      1:          Full duplex operation

                      After changing over from half-duplex to full-duplex operation (and vice-versa) the
                      command interpreter has to be emptied by entering a carriage return.

Value range: 0..1
Initial value: 1

Command GT

<id>GT<para3>   Time synchronization (Get time)
Description: Through this command the synchronization of the DCF77-receiver is started manually.
                      By entering the command 00GT001 the DCF77-receiver is activated, and the internal
                      clock is updated. During the updating all measuring values of the CLIMA-sensor are
                      frozen. The status in the serial output telegram indicates state of synchronization, ref.
                      chapter 9 telegram output. After completion of the synchronization the measuring
                      values are cyclically re-activated.

                      For the command GT the system makes no reply. The status of the time
                      synchronization is indicated in the data telegram.

For the command GT the following parameters are available:

0:	Completes the time synchronization
1:	DCF77 synchronization is started. The buzzer is deactivated.
2:	DCF77 synchronization is started. The buzzer is activated.

Table 3: Manual time synchronization through command GT

During the time synchronization the sensor outputs the following message:

DCF Start: Is output when a minute change is identified. A minute change is identified, when no signal has been received for two seconds. This might be the case also when the sensor has a bad reception.

DT OK: (Date/Time OK) Is output when the sensor has identified a valid date-time-information. If two successive time values are validated the internal clock is set.

Value range: 0..2
Initial value: 0

Command HC

<id>HC<para3>   Internal correction value for humidity measurement (Humidity correction)
Description: This value stands for a factory-corrected parameter for the calibration of humidity
measurement. This value must not be changed.

Value range: 0..255
Initial value: depending on instrument

Command ID

<id>ID<para3>   CLIMA - Sensor ID
Description: Through this command the ID of the CLIMA – sensor determined. The ID must be
stated in every telegram. A bus operation of several instruments is possible by using
an ID .
Example:

00ID023	Changing of ID from 0 to 23
!23ID023	CLIMA - sensor acknowledges change
23DM	Request of duplex-mode with new ID
!23DM000	reply from the CLIMA - Sensor
23ID000	changing of ID from 23 to 0
!00ID000	CLIMA - sensor acknowledges change

Value range: 0..99
Initial value: 0

Command PE

<id>PE<para3>   Number of identified precipitation events
Description: Indicates the number of identified precipitation events within one minute, where the
precipitation output is set.

Value range: 0..255 (sensible 1..30)
Initial value: depending on instrument

Command RC

<id>RC<para3>	Internal correction value for the reference voltage (Reference correction)
Description:	This value stands for a factory-corrected parameter for the calibration of the internal reference voltage. This value must not be changed
Value range:	0..255
Initial value:	depending on instrument

Command SA

<id>SA<para3>	Byte ‚A' of the serial number
Description:	The serial number is composed of three bytes. The parameter stands for the least significant byte. This value is factory-set and must not be changed.
Value range:	0..255
Initial value:	depending on instrument

Command SB

<id>SB<para3>	Byte ‚B' of the serial number
Description:	The serial number is composed of three bytes. The parameter stands for the mean byte. This value is factory-set and must not be changed
Value range:	0..255
Initial value:	depending on instrument

Command SC

<id>SC<para3>	Byte ‚C' of the serial number
Description:	The serial number is composed of three bytes. The parameter stands for the more significant byte. This value is factory-set and must not be changed.
Value range:	0..255
Initial value:	depending on instrument

Command ST

<id>ST<para3>	Moment of time synchronization
Description:	Indicates the hourly value, when the time shall be synchronized. A value >23 deactivates the cyclic time synchronization. During the time synchronization the acquisition of the analogue measuring value is switched off.
Value range:	0..255
Initial value:	24

Command TC

<id>TC<para3>	Internal correction value for temperature measurement (Temperature correction)
Description:	This value stands for a factory-corrected parameter for the calibration of the temperature measurement. This value must not be changed.
Value range:	0..255
Initial value:	depending on instrument

Command TR

<id>TR<para3   Telegram request (Transmit request)
Description: Through the command TR a telegram is specifically requested from the CLIMA-sensor.
                   After the interpretation the CLIMA-sensor transmits the requested telegram. In the half-
                   duplex mode the command TR is the only possibility of requesting the measuring
                   values via the RS485-interface.
Example:

    Request via RS485:
    00TR001

    Reply from the CLIMA – sensor:

    30.05.06 16:13:50;007.8;011.6;003.8;!!!;+20.1;054;+20.1;0;00.0;00;0E

Value range: 1
Initial value: ---

Command TT

<id>TT<para3>   Autonomous Telegram output (Transmit telegram)
Description: Determines the number of the telegram, which is cyclically transmitted autonomously
                   by the CLIMA SENSOR. A telegram is available, here. The telegram is output every
                   second.
                   The autonomous transmission is possible only in full-duplex mode, ref. to **Command
                   DM.**
                   If TT = 0, the autonomous telegram output is deactivated.

Value range: 0..1
Initial value: 1

Command VC

<id>VC<para3>   Internal correction value for the measurement of the supply voltage (voltage
                   correction)
Description: This value stands for a factory-corrected parameter for the calibration of the voltage
                   measurement. This value must not be changed.

Value range: 0..255
Initial value: depending on instrument

13 Maintenance

Please take care that the lamella of the Clima Sensor D are always kept clean, so that the radiation reflection is guaranteed, and a warming-up inside the instrument is avoided. Moreover, the area of the brightness- and precipitation sensors (side and top of the instrument) should possibly free of dust so that the measuring values are not affected in a negative manner. A layer of dirt as a result of atmospheric pollution is usually washed off by the precipitation.

The cup star must rotate already at a low starting velocity in order to guarantee an accurate wind speed measurement. This can be checked visually with slight wind flow. In case the cup star seems not to start or to start only with higher wind speeds, please contact the manufacturer for maintenance.

14 Technical Data

Wind speed	Measuring range	1...40 m/s
	Accuracy	$\pm$ 0,5 m/s or $\pm$ 5 % resp. of measuring value

Precipitation	Measuring range	Precipitation yes/no
	Sensitivity	0.25 mm/h
	Switch-off delay	Approx. 2 minutes

Brightness	Measuring range	0...150 kLux
	Spectral range	700...1050 nm
	Accuracy	$\pm$ 3 % of measuring range

Twilight	Measuring range	0...250 Lux
	Spectral range	700 ... 1050 nm
	Accuracy	$\pm$ 5 % of measuring range

Temperature	Measuring range	- 20...+ 60 °C
	Measuring element	Pt100 1/3 DIN
	Accuracy	$\pm$ 0,5 K @ wind velocity > 2,5m/s

Humidity	Measuring range	0...100 % rel. humidity
	Accuracy	$\pm$ 3 % in the range 10...90 % rel. F. @ wind velocity > 2,5m/s

Electr. Output		
analogue		
	Wind speed	0...10 V (= 0...40 m/s), load resistance ≥ 10 kΩ
	Precipitation	0 V = precipitation "active"
		10 V = no precipitation (passive");
		load resistance≥ **100** kΩ
	Brightness	3 x 0...10 V (= 0...150 kLux), Eastern, Southern and Western direction; load resistance ≥ 10 kΩ
	Twilight	0...10 V (= 0...250 Lux); load resistance ≥ 10 kΩ
	Temperature	0...10 V (= -20...+60°C); load resistance ≥ 10 kΩ
	Humidity	0...10 V (= 0...100% r. F.); load resistance ≥ 10 kΩ
serial		
	Type	RS 422 / 485
	Output	1200…19200 Baud, 8N1, full-duplex / half duplex - operation
	Output parameter	Environmental data, housing temperature, Date, time, sensor status, check sum, CRLF

General		
	Operating voltage	16…24 V AC ; or 16…28 V DC
	Current consumption	approx. 250 mA with condensation protection
	Ambient temperature	- 40 °C...+ 60 °C
	Connecting cable	10 m long ; LiYCY 16 x 0,14 mm², UV-resistant
	Cable length	maximum 100 m at supply with nominal 24 V and min.0,5mm² core sectional area
	Mounting	Niro-mounting bracket on mast or wall
	Weight	max. 1,5 kg
	EMC	EN 61326-1 with ENV 61000-4-3

Dimension	4.9110.00.061	Ø130 x 430 mm
	4.9100.00.061	Ø130 x 335 mm
	4.9111.00.061	Ø130 x 310 mm
	4.9101.00.061	Ø130 x 215 mm

15 EC-Declaration of Conformity

Document-No.: **002001**   Month: 06   Year: 11

Manufacturer: **A D O L F   T H I E S   G m b H   &   C o. K G**

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Description of Product: **Clima Sensor, Clima Sensor D**

Article No.	**4.9000.00.061**	**4.9001.00.061**	**4.9010.00.061**	**4.9011.00.061**
	4.9100.00.061	**4.9101.00.061**	**4.9110.00.061**	**4.9111.00.061**
	4.9110.00.961			

specified technical data in the document: **021497/06/11; 021195/06/11; 021628/06/11**

The indicated products correspond to the essential requirement of the following European Directives and Regulations:

2004/108/EC   DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 15 December 2004   on the approximation of the laws of the Member States relating to
electromagnetic compatibility and repealing Directive 89/336/EEC

2006/95/EC   DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical
equipment designed for use within certain voltage limits

552/2004/EC   Regulation (EC) No 552/2004 of the European Parliament and the Council of 10 March 2004
on the interoperability of the European Air Traffic Management network
(the interoperability Regulation)

The indicated products comply with the regulations of the directives. This is proved by the compliance with the following standards:

Reference number	Specification
IEC 61000-6-2: 2005	Electromagnetic compatibility Immunity for industrial environment
IEC 61000-6-3: 2006	Electromagnetic compatibility Emission standard for residential, commercial and light industrial environments
IEC 61010-1: 2010	Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1: General requirements

Place: Göttingen   Date: 16.06.2011

Legally binding signature: issuer:

....
Wolfgang Behrens, General Manager   Joachim Beinhorn, Development Manager

This declaration certificates the compliance with the mentioned directives, however does not include any warranty of characteristics.
Please pay attention to the security advises of the provided instructions for use.

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